

COST *and* MANAGEMENT

THE OFFICIAL JOURNAL OF

THE CANADIAN SOCIETY OF
COST ACCOUNTANTS & INDUSTRIAL ENGINEERS

INCORPORATED 1920
HEADQUARTERS, 301 MACKAY BUILDING,
66 KING STREET EAST, HAMILTON
R. Dawson, Secretary-Manager
Telephone Baker 0700

Vol. III.

October, 1937

No. 8

.. CONTENTS ..

•

| | |
|--|-----|
| EDITORIAL | 226 |
| AT HEADQUARTERS | 228 |
| CHAPTER PROGRAMS | 229 |
| RESEARCH IN CANADA, by Maj.-Gen. A. G. L. McNaughton, C.B., C.M.G., D.S.O. | 232 |
| SITUATIONS WANTED | 251 |
| FORUM SECTION | 252 |
| REFERENCE LITERATURE | 253 |
| CHAPTER NOTES | 255 |
| NEW MEMBERS | 257 |
| BUSINESS TREND | 257 |
| STANDARDIZATION | 258 |
| OUR PRESIDENT | 259 |
| PAST PRESIDENT | 260 |

Subscription price to non-members, \$5 a year. Single copies 50 cents.
Members desiring 5 copies or more of a single issue may obtain them
at 25 cents each.

EDITORIAL

Ontario Speaks

Ontario spoke in no uncertain terms in the Provincial election just concluded, and Premier Hepburn feels that his stand on the question of the C.I.O. has been perfectly justified. Perhaps this is so, for Mr. Hepburn undoubtedly tried to make this the dominant note of the election campaign, and in this he was ably assisted by his opponents. Mr. Hepburn now gives out the information that Ontario is assured of five years of industrial peace. Perhaps the wish is father to the thought, but business, generally, will echo a fervent hope that the Premier is right. One cannot, however, view an election campaign of the type that we have just witnessed without considerable misgivings as to the type of government to be given Ontario in the next four or five years. Business methods and business ethics were entirely lacking in this campaign, which can be termed one of the "dirtiest" on record.

So much so, that rumblings have been heard on every hand, from all types of decent-minded citizens. The thinking citizen does not desire to see the mud-slinging which characterized the campaign, and if candidates will descend to such depths, what can the citizens hope for in the way of real, honest and business-like administration?

The people gave Mr. Hepburn credit, not for all his past legislation, but for his efforts generally to ease the lot of the average citizen, and for his undoubted courage in his attitude toward the C.I.O. The Premier admits he has made mistakes, and it is to be sincerely hoped that he will remember this fact of his own admission and endeavor to profit by these mistakes, rather than to take the verdict of the people as a mandate to ride roughshod over them in the next four years. He has a real chance to give to the people of Ontario the sound, honest and business-like administration they so earnestly desire, and it is to be hoped that he will take advantage of this opportunity.

Unemployment Insurance.

One of the promises made in the recent Ontario election campaign was that, if returned to power, the Liberal administration would immediately bring down legislation providing for Unemployment and Health Insurance, and there is no reason to believe that this promise will be other than fulfilled at the earliest possible moment. Little or nothing is known at the moment concerning the details of such legislation, but it is generally

EDITORIAL

understood that the proposed legislation will follow closely the British plan, and, in this case, industry will have to pay part of the "shot."

This means, undoubtedly, increased costs, and means, also, that cost accountants will be called upon to decide the best method of treating these increased costs. Apart altogether from this phase, however, it will be indeed interesting to note whether or not other Provinces will follow Ontario in this respect. It is said that Quebec will reciprocate in the matter of industrial codes, but whether or not the Quebec government will follow Ontario's lead in Unemployment and Health Insurance is another matter. If not, how will industry in Ontario react to this legislation?

Ontario industrialists claim they have a hard time even now to compete successfully with certain industries in other provinces, notably Quebec, and, if this is so, the increased costs from a Health and Unemployment Insurance plan will undoubtedly make matters worse, from a cost point of view, unless other provinces follow Ontario in this matter. The Commission under Hon. N. W. Rowell, which will open its deliberations shortly, in Winnipeg, may make decisions which will eventually change the whole complexion of provincial legislation, and, undoubtedly, a Dominion-wide scheme of Unemployment and Health Insurance would be preferable to several different schemes in different provinces.

Governments and Industry.

In these days of regimentation and government control, the thought often arises as to whether or not governments are really on dangerous ground when they try to regiment industry and control prices. We, in Canada, have been more or less free from this sort of thing, but there are those who feel, now that the Ontario government has received from the people an endorsement of its policy regarding the C.I.O., that regimentation and control of industry in some form will immediately follow. We cannot see this argument at all, but we do feel that, by getting together and each trying to assist the other, labor and capital could do much to offset such a procedure on the part of this or any other government. It surely cannot be argued that, merely giving the worker increased pay, or even shorter hours, increases his standard of living. In fact, the reverse is eventually the case, because increases in pay are usually followed by further increases in the cost of living. Temporary advantages do come to those who, by concerted effort, say, on the part of trades unions in a strategic position, enforce their demands on industry, but these advantages are purely of a temporary nature, and only make matters worse in the end. Labor and capital could, if they would, by getting together in a realization of each others difficulties, solve the whole question, and this is what is required.

Surely governments have proved that they have neither the business wisdom or experience to effectively regulate or control industry.

At Headquarters

Good progress has been made already by headquarters in connection with the effort being made to boost the Society, and considerable ground work has been done in this connection. It is sometimes rather difficult to quickly acclimatize one's self to new surroundings and conditions, but, in this case, such difficulties have been conspicuous by their absence, thanks to the many acts of kindness and helpfulness by many members, far too numerous to enumerate here. May we say at this point that we have been greatly encouraged by the many letters received from members from all Chapters, showing approval of the first issue of this publication under the new direction. It is undoubtedly gratifying to receive such epistles, particularly when they contain, also, constructive criticism. Great plans are in the making for this publication, and as soon as they can be put into practical form due notice will be given. Your Secretary-Manager has already visited the Toronto and Hamilton Chapters, and addressed the members at the opening meetings. Much enthusiasm prevailed at these meetings, which augurs well for the future. It will be our privilege to visit the Montreal Chapter on November 12, and to have an opportunity to address the members of that Chapter. It goes without saying that we are looking forward with a great deal of pleasure to this visit.

Membership.

Already, many new members have flocked to our Society, and others will shortly come along, and, in this connection, it is interesting to note, and a pleasure to record, that strong and determined efforts are being made to form a new Chapter in the thriving City of Kitchener, Ontario. The old Central Ontario Chapter did not function properly last year, nor, in fact, for one or two years. This was due to a variety of reasons, the principle one being the fact that the district was much too scattered. This office took the view that better results could be obtained if the district were made more compact, and so, this new Chapter will be confined to Galt, Preston, Kitchener, Stratford and Hespeler. All these cities and towns are within easy reach, and easy of access even in the depth of winter. Much progress has already been made, and it is hoped to start on October 27, when the Hamilton Chapter will stage a regular meeting in the City of Kitchener.

Following this, other meetings will be held in Kitchener, it is hoped, under the direct jurisdiction of a Kitchener Chapter. Many old members of the Central Ontario Chapter have already signified their intentions of joining our Society once more if this new Chapter can be organized, and new members are also very interested. The City of London, Ontario, is another center which will be organized in the very near future, if at all possible, and plans are under way to do likewise in Windsor and also in the Niagara Peninsula. All these are industrial centers with great possibilities. It takes time, however, to accomplish such things, but no effort is being spared, not only to enrol new members but also to branch

CHAPTER PROGRAMS

out with new Chapters. A list of new members is published on another page, and such new faces are extended a hearty welcome to our Society, with the fond hope that they will derive much benefit from their association with us and that we, in turn, will do likewise.

Correspondence.

From time to time, correspondence is received at this office, asking for information on many subjects. On two occasions recently, we have been asked to provide a salary schedule for various office positions. We have taken the view, however, that, inasmuch as this is something that is likely to vary widely in different localities, that it is purely a local matter, and in this the Chapters concerned have agreed. We have, however, received requests for information of a vastly different character, and which is not restricted as to locality. These requests we publish elsewhere in this issue, under the caption "Information Wanted," in the hope that some member, or members, with the required information will be good enough to send same in to this office, from whence it will be transmitted to the enquirer. It is hoped that this new page, "Information Wanted," will be a regular feature of this publication, and members are asked to take due advantage of the facilities offered.

Once more, may we ask members to be patient with us? It is our aim to make this publication one eagerly looked for each month. We desire your constructive criticism, and ask that you do not hesitate to write such criticism. In addition, we desire to make membership in our Society something to be earnestly desired, but, remember, Rome was not built in a day.

Chapter Programs

Program committees in the various Chapters have been busily engaged in formulating programs for the season just commencing, always a hard task for those engaged in this work, but excellent results have been obtained thus far. The Montreal Chapter program is complete, while that of the Hamilton Chapter is completed only so far as the balance of this year is concerned. That of the Toronto Chapter has not yet been completed, but it is hoped that both will be complete and ready for publication in the November issue.

Below we publish the programs of Montreal and Hamilton Chapters:

Montreal Chapter, 1937—

(Lecture meetings in Arts Building, McGill University, 8 p.m.)

September 29th.

Opening dinner.

Speaker—Major-General A. G. L. McNaughton, C.B., C.M.G., D.S.O., M.Sc., LL.D., President, National Research Council, Ottawa.

Subject: "The Organization of Research in Canada."

COST AND MANAGEMENT

October 6th.

Visit to The Consumers Glass Co., Ltd.

October 15th.

Subject: "Mathematics of Management."

Speaker: Mr. Paul Kellogg, President, Messrs. Stevenson & Kellogg Ltd.

October 29th.

Subject: "Power Costs."

Speaker: "Mr. R. A. C. Henry, B.Sc., General Manager, The Beauharnois Light Heat & Power Co., Ltd.

November 12th.

Subject: "Time Factor in Highway Design."

Speaker: Prof. R. DeL. French, B.Sc., C.E., M.A.S.C.E., McGill University.

November 26th.

Subject: "Cost in the Paint Industry."

Speaker: Mr. A. S. Keiller, C.G.A., A.C.I.S., Messrs. Sherwin-Williams Co. of Canada, Ltd.

December 10th.

Subject: "Cost Accounting for Hotel and Hospital."

Speaker: Mr. J. R. Hendry, B.Com., C.A., Messrs. McDonald, Currie & Co.

1938—

January 14th.

Subject: "Depreciation As It Affects Income Tax."

Speaker: Mr. Roland Swift, Special Field Auditor, Department of National Revenue, Ottawa.

January 28th.

Debate: This Chapter (Messrs. Tracey Carton and Cyril F. Rathbone) vs. The Canadian General Accountants Association (Messrs. Arthur Beaulieu and Paul J. Landers.)

Resolved: "That a mutual understanding between management and labour is conducive to ultimate cost reduction."

February 11th.

Social evening: Annual smoker.

February 25th.

Student Night: Under direction of Mr. D. R. Patton, Chairman, Education Committee.

March 11th.

Subject: "Costs in the Printing Industry."

Speaker: Mr. Elmer J. Koch, Secretary, United Typothetae of America, Inc., Washington.

CHAPTER PROGRAMS

March 25th.

Subject: "Merchandising Costs."

Speaker: Mr. D. Labbe, L.S.C., Ecole des Hautes Etudes Commerciale de Montreal.

April 8th.

Mock Parliament: "Bringing Down the National Budget" (farce).

May 6th.

Annual general meeting.

Hamilton Chapter, 1937—

(Meetings are held at the Wentworth Arms Hotel. Dinner at 6.30, meeting at 7.30 p.m.)

October 6th.

Subject: "The Future of Our Society."

Speaker: R. Dawson, Secretary-Manager of The Canadian Society of Cost Accountants and Industrial Engineers.

October 27th.

Subject: "Forecasting Costs."

Speaker: H. M. Hetherington, The Viceroy Manufacturing Co., Ltd., Toronto.

(This meeting will be held in Kitchener, Ont., for the purpose of forming the new Kitchener Chapter.)

November 3rd.

Subject: "Ontario Labor Codes, as Provided by the Minimum Wage Act of 1937, and the Industrial Standards Act."

Speaker: Dalton J. Little, Toronto.

November 24th.

Subject: "The Cost of Government."

Speaker: Chester S. Walters, Controller of Finances, Ontario Provincial Government.

December 8th.

Subject: "The Presentation of Cost Information to Foremen."

Speaker: E. Detwiler, Budget Supervisor, The Worthington Pump & Machinery Co., Ltd., Buffalo, New York.

Research in Canada

By

MAJOR-GENERAL A. G. L. McNAUGHTON, C.B., C.M.G., D.S.O.,

President of the National Research Council, Ottawa, Canada.

An Address to the

Canadian Society of Cost Accountants and Industrial Engineers.

Montreal, September 29, 1937.

Mr. Chairman and Gentlemen:

1. The Canadian Society of Cost Accountants and Industrial Engineers.

I count it a very high privilege to be with you to-night, and to have the honor of speaking to you on this occasion.

May I say, also, that I welcome the opportunity which you have given me of placing before you certain aspects of the work of the National Research Council, and of bespeaking the interest of your members, both individually and collectively, in the search for the solutions of the many problems with which we are faced. By far, the most difficult of these problems are those in the realm of economics—the application to practical purposes of the inventions and discoveries and new processes which are developed in our laboratories—and it is in this field, I think, that constructive criticism from your members, who are accustomed to the rigorous analysis of business methods and to industrial planning of all natures would be most valuable; certainly, we will appreciate any suggestions which you may care to make at any time.

2. Subject of Address: Research in Canada.

I am to speak to you to-night about Research in Canada; why it is necessary; how it is organized; what it has accomplished; what the future holds. In the course of my remarks, I hope to give you some idea of the tasks which have been assigned by Parliament to the National Research Council; of the organization which has been built up to carry them out; of the progress which has been made, and of our plans for development to meet the ever-increasing needs of Canadian industry.

These are very large subjects, and the most I can expect to do in the short time at my disposal is to indicate the general picture of the situation as I see it, and to hope that I may leave with you a few thoughts which will be of use in helping forward the consideration of this matter, which must be given in the public interest.

Recently, the secretary of one of our large associations wrote to me that "the stage of convincing people that industrial research is useful and necessary is pretty well passed." I wish I could agree with him, but I am afraid the situation has not yet developed to that happy state where we can take a recognition of necessity and the provision of adequate facilities and support for granted; and, while I am convinced that there is an

RESEARCH IN CANADA

increasing understanding of the need for organized industrial research, I have not found it so general that we can obviously count on getting what we need.

For this reason, I propose to go briefly into the general situation, and to develop the urgent need in this country of paying more attention to research in all its various branches.

3. Why Research is Necessary.

The civilization in which we live is distinguished from those of the past by its high complexity, by which I mean that no individual or family, or even group of families, is any longer a unit in producing the things or rendering the services which are required in daily life.

In our grandfather's day, life went on much as it had for the previous thousand years or so. The farmer tilled the field and harvested his grain, which he took to the local mill to be turned into flour; the shepherd tended his flocks and the wool was worked into clothing in the homes of the inhabitants; transport depended on the horse, and the village wheelwright produced from local material such simple vehicles as were needed; wood supplied the requirements for fuel; tallow made candles for light; really, about the only thing which had to be imported into any typical community was iron, and this was needed only in strictly limited quantities.

During the last hundred years, this simple system of life has all been changed, and the change has been the **consequence of specialization**.

When men specialize, they acquire, not only manual skill through which the product of their labor is greatly increased, but they also acquire knowledge of a particular trade, and this special knowledge in the minds of certain individuals is the mother of invention. Out of this came the marvelous advance in the mechanical arts which has taken place, and the far-reaching applications of machinery to ease the task and multiply the power and speed of man. In the result, articles are made available in quantity to all for daily use, which, in a previous age, would have been luxuries, unattainable even for the wealthy.

We have become accustomed, and have adapted ourselves, to this higher standard of living, and we would not go back. We could not if we would, for populations have developed which could not exist on the basis of a primitive civilization, and people have to die by the thousands and tens of thousands if there was retrogression.

It seems that man can adapt himself without difficulty to an expanding civilization, but, in a reverse case, or if he stands still, he perishes. **It is the business of research to serve an expanding civilization**; to find new and better methods of satisfying old requirements; to open the way to new services needed by the public, and to create the materials and technique through which they may be developed. Nowhere in all the wide range of sciences is any limit in sight—progress continues at an ever-increasing rate, and the future is beyond conjecture.

In the days of the stage coach, the maximum distance which could be traversed in a day did not exceed about 100 miles. Voyages by sail

COST AND MANAGEMENT

across the oceans were matters of months. To-day, aircraft cruise at over 250 miles per hour, and telegraph and telephones link the continents in instant communication. Measured on a time scale, the earth has shrunk and there would, perhaps, have been no objection to this if the moral side of civilization had kept pace with the material, so that the nations might have learned to work in co-operation and with mutual consideration and forbearance. Unfortunately, this does not seem possible, and the world, as we know it to-day, has become highly nationalized and competitive.

If we fall behind in the struggle, we face disaster just as certainly as did the tribal peoples of early history. To them, the penalty of failure was mercifully swift; to us, it may be long drawn out, but none-the-less unpleasant on that account.

In the past, the conflict between nations was carried out by armies and navies; to-day, the arena of the struggle, except for rare intervals, has shifted to industry, and the prize is markets. So predominantly important has industry become that, unless a nation is highly developed in this respect it is no longer possible for it to have effective armed forces for defence, and so it lives precariously, at the whim of others.

Thus, the efficiency of industry, and I use the term in the broadest sense, is a matter of vital concern to everyone. It is the business of the research organizations of a nation to promote this efficiency in every way; to assist in turning every national resource and facility to account; to improve processes and to cheapen products so as to better the competitive position of their country in the markets of the world, and particularly to be ready to suggest new articles of manufacture when the fashion for the old diminishes, or they stand in danger of being displaced. It is to these activities in aid of Canadian industry that the National Research Council is dedicated.

The Organization of Research.

4. Pure Science.

During the last half century or so, the industries of the world have been modified and built up on the basis of scientific knowledge. The mechanical industries derive from Newton's laws of motion; the electrical industries are based on the early scientific work of Henry, Faraday, Maxwell, Ampere, and down the years, through Edison and a multitude of others; aviation is the outgrowth of hydrodynamics and aerodynamics; the chemical and metallurgical industries make use of knowledge accumulated since the days of the alchemists.

Most of this fundamental information, which has made modern industry possible, was built up slowly in the universities of the world. It was not acquired for any utilitarian purpose, it came as a by-product in the search for truth. This form of research has come, in consequence, to be called "pure science," and it continues to hold a most important place in the scheme of things as they are.

Until toward the end of the last century, only a relatively small fraction of the fundamental knowledge which had been acquired and stored up by

RESEARCH IN CANADA

the universities had been assimilated by industry, and new knowledge was accumulating perhaps faster than it could be applied.

5. Applied Research.

In this period, all industry had to do was to exploit existing stores of information, but, even for this, trained minds were needed, and there was a demand for men who could understand the facts and apply them to the everyday problems with which they were faced.

Experience showed that men who had been trained in the universities in the fundamentals of mathematics, chemistry, physics, etc., were particularly useful, and, first in the larger manufacturing establishments and later extending in ever-widening circles, there began to grow up organizations for what was called "applied research."

Applied research was something that most business men of that day could understand. It was immensely profitable. In contrast, "pure research" was deemed academic, and the men who engaged in it were thought of as people who were not practical. Business was quite content to leave to the universities the pursuit of knowledge for its own sake.

6. Industrial Research.

At the beginning of this century, some forward-looking leaders of industry recognized that industrial application had nearly overtaken the capacity of the universities to produce new facts to work on, and out of this idea "Industrial Research" was born.

On this continent, the first step was taken in this direction in 1901, by Mr. E. W. Rice, of the General Electric Company, who established, under Dr. Whitney, the first industrial research laboratory for the purpose of carrying on fundamental industrial research; that is the acquisition of new scientific knowledge, and the discovery of applications for this new knowledge. This new form of research, backed by the large resources of a great company, was to accelerate scientific progress and to extend the frontiers of human understanding.

Dr. Langmuir, who succeeded Dr. Whitney, has rightly observed: "Such research work cannot, usually, be directed toward definite goals, for it involves unknown factors. Success, if attained, is often reached by wholly unexpected methods, and the problem which is finally solved is not the problem which was foreseen."

That the idea of fundamental industrial research was "practical" was soon amply proved. In the field of lighting alone, three major improvements came out of the organization which Rice created, and these, in their result, decreased the cost of illumination by four-fifths; it has been estimated that, on present costs for electrical power and rates of use, the saving to the public in the United States brought about by the modern lamp as compared with the carbon filament, amounts to some five million dollars a night. It has been further estimated that, for every dollar of profit made for the company by innovations developed in this laboratory, the public has been saved a hundredfold.

COST AND MANAGEMENT

The example set by the General Electric Company was quickly followed and many of the larger industrial corporations now maintain departments of considerable size devoted to industrial research; for example, the Bell laboratories in New York, concerned with solving problems in the sphere of electrical communications, have a staff of some 4,000 persons, of whom about one-third are scientists holding graduate and post-graduate degrees.

7. Research in Germany.

I want, now, to turn your minds back for a decade or so, and to ask you to look at Germany, where research—pure, applied, and industrial—had early been recognized as a matter of profound concern, and where its organization and correlation had been taken under the auspices of the government. Under this jealous care, every idea and invention was seized upon and subjected to intensive development at the hands of large groups of trained scientists; eager business men stood ready to exploit whatever they produced.

There are many in this room to-night who will remember how this—and the neglect of other nations—had reacted on German world trade to the point that eminent authorities have said that, in 1914, she had no need to embark on war of the older fashion in order to become mistress of this globe. The prize was within her reach, and it was only her impatience which eventually caused her to be set back.

You know, also, of the great difficulties which faced the Allies on the outbreak of hostilities, by reason of the German monopolies. The German dye industry, for example, which had taken the invention of a British chemist and turned it into a great commercial undertaking, led directly to efficiency in the production of explosives and of poison gas.

I have often wondered why this menace was suffered to develop without adequate counter-measures being taken, and it seems, on looking back, that its very gradualness must have been the answer; men's minds becoming accustomed to it by degrees. It is true that, in England before the war, they still had the momentum of the earlier industrial development, the individual initiative of their captains of industry and the skill of their workmen as assets which had not yet been overtaken, while we in Canada could think that our boundless natural resources and our virgin wheat lands would provide an inexhaustible treasure for which we could draw tribute from all the world.

8. The Impact of the War on Research in Great Britain and Canada.

The impact of the war shook the complacency of the British peoples, and it was out of that event that our organized research was born, and this was true both in the United Kingdom and in Canada, and, also, to some extent, in the U. S. A.

Great as was the contribution made by our manhood on the field of battle, great as were the triumphs of our armed forces, it seems, on sober reading of the histories of those times, that at least an equally essential contribution was made by industry once scientific and industrial research was organized and brought into play.

RESEARCH IN CANADA

To illustrate what was accomplished in Great Britain, I mention a few significant facts . . .

In 1914, there was no optical glass industry in the United Kingdom. Germany and Austria had a practical monopoly in this field, and even the lenses for the sights of British guns were imported. Organization of the scientists in 1916, followed by extensive basic and applied research, corrected this situation. To-day, the production of optical glass in England is of the finest quality in the world. They are self-sufficient, not only for defence, but in the peaceful arts as well, and, under the watchful eye of a committee of the Department of Scientific and Industrial Research, there is no danger of a failure in this field.

I mentioned poison gas. Chlorine, a product of the German chemical industry, was used against the French and the left flank of the First Canadian Division on April 22, 1915. The Germans used it because they thought the Allies would not be able to reply in kind—they were contemptuous of our scientific organization—but, by the summer of 1918, as a result of organized research, our chemical industries were producing "mustard" by a new process at a rate many times that which had been found possible in Germany.

There are here in this city men who had a hand in organizing Canadian industry for war, and who took part in the great investigations and research which that enterprise demanded. They can be rightly proud of what they accomplished, and of the team play and co-operation which marked that undertaking under the leadership of Sir Joseph Flavelle, who continues to this day to take a great interest in the Ontario Research Foundation, which he was instrumental in establishing. To illustrate the magnitude of their achievement, I mention one isolated fact alone: For the year 1917, Canada produced over 46 per cent. of the field gun ammunition acquired from all sources for the British armies, and, in addition, substantial quantities for our Allies, France and Russia.

The records show that Canadian shells were as low-priced as any, so our industry was efficient, and no one disputes the high quality of the product.

Apart from every other advantage, the financial benefits from this industry went a long way to saving Canada from bankruptcy, and enabled us to continue with our forces in the field unimpaired until the end.

The National Research Council.

9. Origin.

As I have said, the organization of research in Canada, as a function of government, dates back to the impact of the war. In 1916, Canada, following the example of the United Kingdom, established an honorary advisory council for scientific and industrial research.

It was not contemplated at that time that this council should set up laboratories of its own; it was to act as an agency for consultation and co-ordination between those already carrying on research in the established

COST AND MANAGEMENT

laboratories of the several departments of the Dominion and Provincial governments, in the universities and in industry.

To give you some idea of the very limited facilities then available—a report prepared at the time indicates that the annual expenditure on research in all governmental laboratories, Dominion and Provincial, amounted to considerably less than \$100,000, and that of some 2,400 leading Canadian firms, engaged in manufacturing, who replied to a questionnaire, only 37 had laboratories which even pretended to engage in research. The total annual expenditure of these firms for research and testing, apart from salaries, the figures for which are not available, amounted to some \$135,000.

That is, and making a liberal estimate for the cost of research in the universities, the total expenditure for all agencies in Canada must have been considerably less than half a million dollars annually.

Looking back at the history of the honorary advisory council for scientific and industrial research, it is remarkable what has been accomplished with the limited facilities at their disposal, but it is not to be wondered at that men, who were informed on the subject, should have realized the utter inadequacy of the provision which had been made and that they should have pressed for some improvement.

As a result of this pressure of public opinion, the matter was repeatedly considered in Parliament, and, eventually, the Research Council Act was passed in 1924 under the guidance of the late Honorable Jas. Malcolm, then Minister of Trade and Commerce, and the construction of new laboratories on Sussex street, in Ottawa, commenced.

These laboratories were opened in 1932. As was perhaps to be expected, the appropriations made available during the period of depression were on a substantially lower scale than those planned, and, as a consequence, the organization, both as regards staff and equipment, is far from complete. It is now our business to rectify these deficiencies, and the only way in which it can be brought about is to see to it that, with what we have, a service of value is given to the public.

10. Organization.

The National Research Council to-day consists of fifteen members, selected, for terms of three years, from among men prominent in scientific work in Canadian universities or in Canadian industry. The Council is required by statute to meet at least four times annually in Ottawa. There is a president, appointed by the Governor-in-Council for a term of years, who reports directly to the Privy Council Committee on Scientific and Industrial Research, of which the Minister of Trade and Commerce, the Hon. W. D. Euler, is the chairman.

The Council's membership is broadly representative of all parts of Canada, and includes persons qualified to speak authoritatively on education, science, industry, business and finance. From Montreal, the Council's membership includes Mr. Julian Smith of the Shawinigan and other companies, and Dr. A. Frigon, formerly of the Ecole Polytechnique, and now associated with the Canadian Broadcasting Corporation.

RESEARCH IN CANADA

The Council is a body corporate, capable of suing and of being sued, of acquiring and holding money, property, etc. By statute, the Council in addition to certain specific duties set forth in the Act, "shall have charge of all matters affecting scientific and industrial research in Canada which may be assigned to it by the Committee" of the Privy Council.

Apart from administration, which is organized much on the usual lines of a department of government, the staff of the Council is grouped in a number of divisions, each under a director: Research Information, concerned with the collection, collation and issue of scientific information, and with the general planning of co-operative investigations through committees, etc.; the Divisions of Biology and Agriculture, of Chemistry, of Physics and Electrical Engineering, of Mechanical Engineering, including Hydraulics and Aeronautics, are responsible for the direction and conduct of the technical work in the fields indicated by their designations. Provision is made for the closest co-operation and collaboration between all branches concerned in any particular problem. At the present time, the staff comprises a total of 173, of whom 70 are graduates or post-graduates. There are also 41 additional research workers, of whom 19 are graduates, employed directly under committees.

The organization is growing gradually, as need indicates, and as increased support becomes available. Next year, we expect to add an additional 25 or so workers.

11. Associate Committees and Co-operative Research.

In order to bring to bear the knowledge of scientific men and industrialists, and to correlate the work of all research organizations concerned, a number of so-called associate committees have been set up. These meet as the occasion may require, but, in this era of limited finances, much of their work has necessarily to be done by the less satisfactory method of correspondence.

The function of these committees is to direct co-operative research on the problems assigned to them; to settle the objectives; to indicate the individuals or organizations which should undertake the several component parts of the inquiry; to receive and co-ordinate the resulting information; and to make it available to those who will turn it to advantage.

The Council endeavors to insure that these committees are comprehensively representative of all interests, and we expect them, each in their proper sphere, to form a national plan into which all who are in a position to contribute information can fit their own particular lines of research.

Time does not permit me to recite to you to-night the long list of these associate committees which have been set up during the period since 1916, nor to give you very much in the way of an outline of the important work which they have carried out for Canada.

I would, however, by way of illustration, like to tell you something of a group of committees which are organized under the joint auspices of the Department of Agriculture, and of the Council, and on which most of the

COST AND MANAGEMENT

Provincial government agricultural services are represented, as well as the universities and other organizations which are in a position to contribute information. I refer to the committees on Field Crop Diseases, on Grain Research, on Market Poultry, on Potato Research, on Storage and Transport of Food, on Weed Research. In each case, these committees have been in existence for ten years or more, and very notable results have been accomplished.

The work of these committees is described in detail in our last annual report, a copy of which is available for the asking.

The Grain Research Committee is a co-operative organization, and has developed new varieties of rust resisting wheat, and these have been thoroughly tested, not only from the rust resisting point of view, but for their milling and baking qualities. We have every confidence in them, and they are now being multiplied, and this new seed will be available in considerable quantities for the spring sowing in 1938. Every one here knows, no doubt, what rust resistant wheat means to Western Canada, and, through Western Canada, to the whole Dominion. We have had losses due to rust alone of \$100,000,000 in a single season, and the only people who like it are those who have surplus stocks of grain on hand. If we can take that element of hazard out of the grain growing business, it tends to put it on a better basis, and gives some certainty to the farmer as to what he will reap when he has sown.

I mentioned the Weed Committee, which is developing a very active program of research—some of the work is being carried out in our own laboratories, some in each of the three Western universities, and some in the Department of Agriculture. The task is split up, but the results are all brought together in the Committee for joint consideration. Weeds in Western Canada cost the farmer something like \$80,000,000 a year, and even a small success is an immense contribution to the standard of living in that great Western country of ours, and, of course, it has its application to the rest of Canada as well.

In connection with our Associate Committees generally, I would like to pay my word of tribute to the hundreds of men with special scientific or industrial training and experience, who, without any remuneration whatever, have associated themselves with the Council in this work; who have pooled their knowledge unreservedly, and out of whose collaboration many important developments have been brought, and are being brought, to a conclusion.

12. Assisted Researches.

In order to make use of the facilities for research which exist in a number of our Canadian universities, the Council, in the early years of its existence, developed a system of "assisted researches" so that projects of importance, which, otherwise, could not be undertaken, would proceed under the competent direction of members of a university staff. An application for any particular investigation, setting forth the proposals in detail, its objective, the facilities available, the assistance required and the estimated cost, is submitted by the professor in charge through the head of his faculty

RESEARCH IN CANADA

to the National Research Council, where they are reviewed. Any grants which are made are restricted to the provision of needed apparatus, hire of labor, travelling expenses, etc., and no contribution whatever to the salary of the applicant is made.

Through these grants, much useful work has been accomplished, and it is hoped that, as more funds become available, they may be given in larger numbers.

13. Scholarships.

In order to provide for the advanced training of selected young Canadian scientists, the Council each year grants a number of scholarships, which may be held at Canadian universities or, in exceptional circumstances, at selected educated institutions abroad. For the current year, awards have been made to 47 students. These were selected from some 93 promising applicants, so it would appear that this branch of our activities could be increased with advantage.

I would say that the Council's Scholarship Committee are deeply sensible of this need, and that, in accordance with their recommendation, the government has seen fit to nearly double for the current year the provision which was previously made. Half of the additional funds have been devoted to increasing the number of ordinary scholarships which the Council awards, and half to new classes of scholarships which have been instituted at the instance of some of our Canadian universities, and which are designed to open the special facilities which are available in the laboratories of the Council to selected post-graduate students who, otherwise, might have to go out of Canada to pursue their chosen lines of research. The National Research Council is not a university and has no intention of entering this field, except by way of assistance and on request.

No student will be accepted for these special scholarships unless one of our universities so requests, and gives assurance that his work with us will count toward the higher degree to which he is proceeding.

We have made limited provision, also, to receive some post-Ph.D. students to bridge the gap between their academic training at their university and their absorption in some specific Canadian industry.

14. Industrial Research in Canada.

I would like now to direct your attention for a few minutes to certain aspects of industrial research in Canada which merit consideration. The truth of the matter is that we are not doing nearly enough work of this character; that we are allowing ourselves to remain in a position of dependence upon other countries; that, for this, we are paying tribute on an enormous scale, and, worse, we are not obtaining and passing on to the Canadian people the benefits which they have every right to expect.

As is well known, most of our principal industrial companies have affiliations with larger organizations abroad, to whom there has been a natural tendency to refer any research problems that arise from time to time. It is often very difficult to examine these problems completely, apart from the special environment in which they have come to attention, and

COST AND MANAGEMENT

the solutions proposed are often, therefore, inadequate, and, both on this ground and on account of delays, very heavy losses are involved.

A more serious loss is due to the fact that, without a corps of trained investigators on the spot, the needs of the situation are not fully appreciated and many opportunities for useful inventions and developments are missed or unduly delayed.

15. Economics of Research.

One of the things about organized industrial research which has been impressed upon me in many discussions which I have had on this subject is the curious difficulty there seems to exist in getting people to think about it in terms of economics, and this is true even with engineers and business executives who are accustomed to applying the well known principle of "least costs" in their everyday decisions.

When it comes to research, in place of balancing resulting savings against their cost, you meet with these sorts of statements, and I am quoting from responsible authorities . . .

In England, electrical research, which cost some £80,000 in all, is now estimated to be saving that industry not less than £1,000,000 **per annum**. The statement goes on to record that, in the iron and steel industry, co-operative research led to a saving of £400,000 per annum in coke alone, and of £1,500,000 in finished steel, and that one small project in flax development put an extra £60,000 into the pockets of the growers during 1935.

These results are no doubt gratifying to the men engaged in the researches in question, but the analysis of the figures shows that an annual benefit has been derived perhaps a hundred times greater than the total expenditure on the research which brought it about. Does this not indicate and prove that not nearly enough research has been done?

16. Research in Russia—A Comparison with Canada.

I believe the best way to obtain a view of our position in respect to the adequacy, or otherwise, of our attention to research is to take the situation which exists in some other country, and to measure up our own facilities against it. For the purpose of this comparison, I have chosen Russia, partly because we happen to have very complete information available as to what they are doing there in the realm of scientific research, and partly because of the similarity of their conditions and natural resources to those which we have in Canada. On account of this similarity, we have to foresee their production of the same things as ourselves for sale in the markets of the world.

The annual expenditure on the Russian Academy of Science, which is only one of their many agencies for research, mounted from about four million roubles in 1928 to 17 million in 1933, and to over 44 million in 1934; that is an eleven-fold increase in a period of six years. Altogether, in Russia there are in existence 840 institutes engaged in research, which is twice as many as in 1930, and in these, in 1934, 47,900 persons were engaged in research work. Their annual expenditure on research is reported

RESEARCH IN CANADA

to be now in excess of 500 million dollars, and is planned, by the end of 1937, to have a capital investment of some 2,000 million dollars. These are large figures. The latest information we have shows that the budget for Russian research continues to increase just as fast as they are able to produce new, trained workers through their modernized educational system, and it is clear that no limit has yet been set. We know—and it is significant—that the leaders of their defence forces are attaching the greatest importance to the pressing forward of these various organizations for research. Russia has a population of 186,000,000, which is some 20 times ours. If you divide their figures by 20, it will give you an idea of what we would have to spend and what effort we would have to devote in Canada to this problem if we were to raise the intensity of our effort to the level of what is actually being done in Russia at this present time.

If you divide the Russian research workers by 20, it gives 2,500. If you divide their current expenditure by the same figure, it will give \$25,000,000 per annum. We have in our own National Research Council employed at the present time a total of 214 scientific workers and assistants, and we have an annual budget, apart from what we receive from industry, of \$621,500. This does not tell the whole story, because there are other departments of the Federal Government which have responsibilities for research from the national point of view, and there are a few other organizations, such as the Ontario Research Foundation, under Dr. Speakman, which are taking an interest in certain national aspects of research. But, nevertheless, this comparison indicates that our provision has been very far short.

Again, I would remind you that, in the principal industries of this country, we are dependent for our research on our friends from across the border, and in Europe, and, while we appreciate that assistance and service, I do think that, in our own interests, it is wrong to continue to depend on it.

It is wrong from many points of view, not the least of which is that the young research workers whom we are training in our university courses and scholarship schemes are leaving us. They have to go abroad for employment. It has been my business to try and bring some of them back, but, when we have one position available for a research worker, I find anything up to 70 fully qualified applicants, any one of whom I would have been glad to have working on our staff.

Compare this with Russia, where they are pouncing on every qualified man and turning his brains to service on national account to improve their position. On the other hand, we are dissipating our resources and not using the brains that have been given to this country. Our men are making a contribution in foreign lands, but they ought to be making it in Canada. We are willing to share the fruit of their labors with other countries, but we would like to see them doing their work where Canada would get some credit, and where it would redound to our national advantage.

In Russia, we have the case of a country which was formerly one of the most backward in the world in industrial development. Leaders of great vision have grasped the opportunities presented by organized research

COST AND MANAGEMENT

and are dealing with the matter on an adequate scale. Their progressive development is acquiring momentum which bids fair to carry them to a leading and, possibly, to a predominant position in the world. In the face of this, can we afford to rest content with our own limited facilities?

I have probably said enough to show that we can, by no manner of means, afford to regard the situation in Canada with complacency, but, on the contrary, we should use every endeavor to interest those concerned, and particularly our manufacturers, so that we may conserve what we have in the way of trade in our own markets and in the markets of the world in the face of the ever intensifying competition from new, improved, and cheapened products of other lands.

It seems to me that one of the most important aspects in respect to the organization of our industrial research which must receive consideration is **the cost of not doing it**. There is no use in resisting the natural trends of development, for that is an impossible task. We must put trained investigators to work to find other uses for our products in danger of being displaced, and they must find new products which can be made from available raw materials in order that stability of employment and of capital investment may be maintained, and particularly that the appalling waste and misery which comes in the trail of any decadent industry may be avoided.

The nucleus to do this work for Canada exists in the National Research Council, which, as I have said before, is dedicated to help Canadian industry and, I can assure you that our staff stands ready and willing to bring our resources to bear in aid whenever required.

17. Routine Testing and Analysis.

One of the most important principles of organization where you are concerned with getting the most out of limited resources in any field, is that you should, in the first instance, reserve particular facilities for the task which they alone are capable of performing.

For example, in the National Research Council, we have a relatively small group of very highly trained scientific workers. We need their services on a multitude of great national problems, and it is quite wrong to use their time on local problems and on routine testing and analysis, provided this work can be done elsewhere. I mention this to show that the Council has no intention of invading the fields of the commercial laboratories; in fact, quite the opposite; we are anxious that as much work as possible should be given to them to do, so that the time of our staffs can be conserved for their proper function of research.

While you can lay down a general principle of this kind, you will appreciate that its application in an institution deriving support from the public is not free from difficulties. The Council must, of course, do whatever testing is required by other departments of the Federal government, and it must give a service to the general public which is not elsewhere obtainable.

To meet the situation as far as practicable, all routine testing work

RESEARCH IN CANADA

has now been placed on a fee basis, and the schedule of charges is being revised upward to act as a deterrent to unnecessary requests; also, we plan to compile a comprehensive list of commercial testing laboratories and their facilities, so that we may be able to refer inquirers to them. I hope that this will result, not only in relief to the Research Council, but in added business to commercial laboratories and consulting engineers.

18. Scientific Information.

From your own experience, you are no doubt aware of the great importance of making a close study of the literature before embarking on any research or investigation, for it may be that what you require to know has already been found out and reported, and, if not, you will at least have the result of other people's thought on the matter as a guide to you in your work.

Like other forms of research, a study of the literature is a matter for experts specially skilled and experienced in the art, and, for this reason, the Council has established a Division of Research Information, which is charged with the duty of doing this work for our other scientific divisions, for our Associate Committees and, within the limitations of staff, for Canadian industry as well.

The Division of Research Information is responsible for the Council's library, which now contains upward of 19,000 volumes of reference works, and receives annually some 800 scientific and 300 other serial publications. The aim has been to develop it as a complement to other scientific and reference libraries in the Dominion, so that, through a loan and photostar service, inquirers from anywhere in Canada may be given promptly the information of which they are in need.

The Division of Research Information is also responsible for the editing and publication of the Canadian Journal of Research, which now supplies a medium through which the work of all Canadian scientists can, if they wish, be reported. The Journal now goes to most of the principal libraries and scientific institutions in the world. During my visits to a number of centres in Great Britain last summer, I was gratified to find well thumbed copies on the tables of a number of workers, and, in discussion, repeated and favorable reference was made to the papers which had been published in it. I, therefore, feel that the Journal is helping in a substantial measure to secure that recognition for Canadian science which is due to the class and quality of our workers. Without the Journal, Canadians would be forced to publish abroad, and the identity of their work would, to a large extent, be lost.

I referred, earlier this evening, to the progress being made in the United Kingdom in the organization of research. Under the policy of the Department of Scientific and Industrial Research, research associations have been created in the principal British trades and industries. Among others are the electrical and allied industries, iron and steel, non-ferrous metals, refractories, cotton, linen, wool, leather, paint and varnish, automobiles, etc. These associations, which are very active in research in their respective fields, are open to representatives from the Dominion, and the National

COST AND MANAGEMENT

Research Council has taken membership in a number of them, so that copies of their reports may be available in Canada for reference purposes, and such of these reports as are not confidential constitute an important source from which the Division of Research Information compiles answers to inquiries.

19. International Scientific Conferences and Meetings.

For similar purposes, the National Research Council maintains membership in a number of international organizations of scientific and research workers, and, whenever it is considered that a useful purpose would be served commensurate with the cost, members of our staff are detailed to attend the various meetings. In addition to making contacts with workers in related field, it is their business to gather all information obtainable so that Canada may have the benefit and, particularly, that we may have timely warning of any important developments in prospect which may affect our trade and industry.

20. National Research Laboratories.

I have outlined very briefly the functions of the National Research Council, and I would now like to tell you of some of the work which is in progress in our own laboratories.

The Division of Physics and Electrical Engineering carries the responsibility for the maintenance of the ultimate standards of electrical units, etc., and equipment has been provided so that precise calibration of measuring instruments for industry can be carried out. By statute, the Council's staff are responsible for type approval listing of all meters used for the measurement of electricity for sale; we are now equipped to discharge that duty.

We have a heat laboratory, where tests of new types of building material are carried out to determine their thermal conductivities. It is very important that accurate information on insulation should be available to architects and designers, so that appropriate steps may be taken to cut down the heat losses.

We have a sound laboratory, which is studying questions of acoustics so as to aid in developing new materials and the methods of using them, with a view to improving public rooms and even private houses from the point of view of sound absorption.

We have an x-ray laboratory, now being equipped to 600,000 volts, where work on the radiological examination of castings and welded joints is carried out. This laboratory is also responsible for the standardization of x-ray dosage meters which are in use in the hospitals throughout Canada.

We have laboratories which do the testing of radio receivers, standardization of sets so as to make sure that the minimum requirements from the point of view of safety and fire hazard, and so on, have been met. All that work is very detailed and laborious.

Chemistry, since the days of the alchemist, has developed into a very broad subjects, and, so, in our Division of Chemistry, we have had to

RESEARCH IN CANADA

specialize on the problems of first importance. The problems assigned are those concerned with Canadian resources available, if properly used and exploited, to take the place of something which is imported as a finished product. I will mention one or two out of a score of subjects under investigation.

Western colloidal clays have been processed to yield a bleaching clay, suitable for use in refining gasoline, lubricating oil and vegetable oils, equal, if not superior, to foreign clays which are being imported to the extent of over \$300,000 a year. This sum might very well go into the pockets of our own producers and help develop our own industries.

Then, there is the question of carbon black. We are vitally interested, because we have a great rubber industry, and carbon black is used to mix in with rubber to increase its wear resistance. Motor car tires require a considerable quantity, and we imported 14,000,000 pounds last year. In the natural gas in the Turner Valley oil fields, we have a material which is going to waste, from which our requirements could be met. Our chemists have worked out a process by which that gas can be turned into carbon black with extraordinary efficiency—in fact, with some four-fold greater yield than anything achieved in the past. With an efficiency of that sort available, surely we can look to some Canadian industrialist to take hold of these patents and apply them so that we may obtain some value out of that gas which is, at present, being blown off in the atmosphere at the rate of millions of cubic feet a day.

As examples of other activities in our laboratories, I would mention: Industrial standardization, in which field the Council's work is very closely linked with the Canadian Engineering Standards Association, under the chairmanship of Mr. J. G. Morrow; safety codes; the discovery of new chemicals which have an amazing effect in promoting the development of root formation in plants and young trees; the new cathode ray compass and direction finder, which promises to have an important place among the radio aids to air navigation, particularly on the trans-Canada airway in the mountainous regions of the West, where other methods have proved unsuitable; the Council's work in connection with the establishment of the radium industry in Canada, which was gracefully recognized last year by the presentation of a magnificent commemorative plaque of silver; aeronautical research and the testing of aircraft and engines, and the development of new instruments and accessories to meet our special conditions; malting research, directed to the testing of new barleys which are being developed to meet the requirements of an important possible market abroad, and of the allied work on hybrid grains, through which varieties previously sterile have been endowed with fertility so that their desirable characteristics are now heritable.

The list of work in progress is very long and diverse, and as all projects possess possibilities of economic importance, I would like to have told you about them in detail, but this is not possible as each one is a subject for a full lecture in itself.

COST AND MANAGEMENT

21. Survey Research.

I would, however, like to take the subject of survey research to illustrate the way in which our work is organized and how it proceeds.

The organization of survey and the production of maps is primarily a function of the Dominion Government. Prior to the consolidation, which has recently been effected in the new Department of Mines and Resources, survey has grown up in a series of separate divisions in a number of departments of state. As a matter of fact, under the conditions existing in pre-war days, there was no particular reason why the various branches, such as the geodetic, topographical, hydrographic, etc., should have been closely associated, as their tasks were clearly distinct, and their methods had little in common. However, the advent of the air photograph, immediately after the war, completely changed this situation, and presented a powerful new tool to every branch, and it became of urgent importance; first, that the requirements of all branches for photographs should be co-ordinated so that the best possible use should be made of the limited flying time available, and, second, that all concerned should come together in the research work required, if this new method of survey was to be turned to the best advantage of Canada.

It is not my purpose to talk to you to-night of the work of the inter-departmental committee, which was set up to control the operations of our photographic aircraft, except to mention that, under its auspices, in the period from 1922, some 700,000 photographs, covering 650,000 square miles, have been taken, filed and indexed in our national collection. What I wish to tell you about is the Survey Research Committee, which was charged with the duty of developing the new instruments and methods which were needed in the preparation of maps possessing that high precision in the representation of relevant detail and topographical features which is required in order to serve the purposes of economic development.

The Survey Committee comprises, not only the technical officers of the various branches of survey, but, also, representatives of the user and operating services as well, and they provide a forum where difficulties, present and prospective, can be discussed and solutions suggested.

From the Council's staff, technical experts in almost every line can be brought in for consultation and advice; expert chemists to advise on plate emulsions and developers, inks for printing and paper to meet the special needs of maps; physicists on lenses and other optical devices; engineers on mechanical problems, such as are presented in the axis bearings of precise theodolites; skilled designers who can take the general ideas suggested for new devices and work them into apparatus which is practically realizable, and last, but not least, a very competent workshop in which these new instruments can be constructed to a degree of precision and finish which compares favorably with the best that Europe can turn out.

In saying this, I would wish you to realize that I am not talking about hopes only, for this committee has behind it a long record of useful accomplishments, and, in this connection, merely by way of example, may I mention one item of the work of the sub-committee on contouring from

RESEARCH IN CANADA

air photographs and instruments for plotting? I refer to the radial line stereoplotter which has now been completed and put into use. I am assured that already this machine has cut the time required for the measurement of detail on vertical photographs in half, so that there is no doubt that our investment in time and money will be well repaid. The instrument cost us \$2,842 to build, and this went largely to Canadian workmen. Alternatively, we estimate that at least \$21,000 would have been required if the contract for the machine had been let abroad, and then we would have failed to acquire that knowledge and experience which only goes to those who essay to launch out and pioneer a new development.

The experience gained in this venture alone is more than worth the whole cost, because it gives confidence in undertaking to find, ourselves, the answer to the many special problems that face us in the mapping of the vast spaces of Canada—problems which differ both in degree and in kind from those of any other country on earth. If we waited for others to produce the answers we require, we would wait in vain.

In the remarks which I have just made, I have been thinking of the air photograph in terms principally for supplying topographical information for maps, and, in the facility for their use for this purpose, I think as a result of experience and research, that we are well advanced.

But the air photograph is useful for many other purposes as well. We think that now we should be able to carry forward a traverse for several hundred miles without even having to go on the intervening ground at all. To help in the investigation of this problem, a special instrument, known as a stereogoniometer, was designed by Mr. Fourcade, a South African. The design of this instrument has been modified to suit our special requirements by our own technical officers and, thanks to the generosity of the Imperial Oil Company, funds have been provided for its construction, and an order has been placed with Messrs. Barr and Stroud, in England. I look forward to the arrival of this instrument, possibly next year, as opening a new line of usefulness to air survey.

As I have said, the development of survey from air photographs represents the most important innovation in survey methods which has been made since the Great War. In the other fields as well, the closest attention has been given to the development of new methods and instruments, and some important improvements have been made which are all the more creditable when you consider the high state which the art had reached before the period in question. However, it is clear that the greater share of the credit for the remarkable increase in the rate of production, as well as in the quality of our maps, undoubtedly belongs to air survey and to the scientific research which has been carried out; this is reflected in the fact that in the whole history of Canada, up to 1922, only some 240,000 square miles of our territory, mostly in the settled portions, had been mapped. Since 1922, and the arrival of the air photograph, 481,000 square miles have been mapped, and this area lies mostly in the more difficult, unsettled, regions, where, previous to the development of the air, it was impossible to do any detailed survey at all. For this north country, the air

COST AND MANAGEMENT

has wiped out a frontier and opened new lands for economic development. In 1936, the mail and freight carried by air into these parts exceeded 26½ million pounds, marking a gain of some 9 million pounds over the total for the next preceding year. It may be of interest to note that, in 1935, the latest year for which comparative data are available, the freight carried by air in Canada represented 80 per cent. of the total for the British Empire, three and one-half times that of the United States, and one-third of the total for the world.

As a result of patient investigation being carried out, principally in the Department of Mines and Resources, new uses are being found for air photographs in forest inventory work; in the study of road, railway and transmission line location; in the geological field for ascertaining the position of faults in the earth's surface so that prospectors may be guided to the most likely areas of mineralization; in water power development; in city planning—to mention only a few of the wide variety of purposes which have been served.

To give point to the economic value of this work, I would merely mention that some of the photographs in the national collection have been put to over twenty separate uses in a single year. The average is estimated at over ten uses for each photograph. In one case, in Manitoba, as a result of information obtained from these photographs, an important new road to a mining area was shortened by 31 miles, at a saving of \$5,000—\$7,000 per mile—the saving on this one project alone exceeding the total cost of all photographic flying in Canada for the year.

The wide diversity in the application of air photographs means that the costs chargeable to any one service are proportionately reduced, thereby still further extending the possibilities for economic use.

I think I have said enough to indicate, in a general way, the value, the economic importance and the economy which comes from the use of air photographs and, in consequence, the importance of the research work which is going on in this field.

22. Conclusion.

I have told you something of survey research to illustrate how the work of the Council fits in with the activities of the Departments of Government. We have equally close relationships with some of our Canadian industries, and, now that a basis has been worked out for co-operative arrangements and for the payment to the Council of royalties on inventions, this section of our work is increasing, but, as I have indicated earlier in this paper, the need is very great and much remains to be done.

There is just one further thought about industrial research which I would like to give you before I bring these remarks to a close, and that is it must be **patient**. I have just been going through the work of one of our co-operative investigations commenced by the Council in 1924, that is thirteen years ago. This particular investigation has now at last proved eminently successful and, while the company with which we have co-operated has not yet paid any dividends, I hope the rewards of faith will now not be

SITUATIONS WANTED

long delayed. However, what is probably more important than immediate dividends is that the result of this research has changed Canada from the status of importer to exporter of certain materials vital to the steel industry. It has given a steadily increasing volume of employment, and wages have been paid without interruption. The returns to the Council by way of royalties on the product are fully financing the further research in hand, and I have every reason to hope that, in due course, all our former expenditures will be repaid.

To give an idea of the relative magnitude of other benefits which have resulted, I would mention the fact that the additional freight revenue to one of our railroads which carried the products of this industry now amounts annually to the equivalent of the total of our investment in the investigation to date. Looked at from the point of view of the national balance sheet, the amount of money which now comes into Canada annually as a result of this one piece of work alone, is in excess of the total being spent on the National Research Council for all purposes.

The requirement of patience and a long-time view is another reason why the leaders of industry should see to it that there is no avoidable delay in placing Canadian research on an adequate and proper basis; this is clearly required for their own protection.

SITUATIONS WANTED

A young man, aged twenty-five Collegiate graduate, and with four years' experience in cost work, desires a change to a position offering opportunity for advancement. Is at present employed in a Western Ontario City, but would consider position elsewhere, preferably with sound employer engaged in furniture manufacturing. Willing to accept a reasonable salary to commence. Apply, Box 14. Cost and Management.

Cost Accountant, with ten years' experience in Cost and General Accounting, at present employed, is desirous of change. Would consider offer of responsible cost position in Ontario. Has sound knowledge of machine shop practice and foundry work, and is fully capable of taking complete charge. Apply, Box 16. Cost and Management.

FORUM SECTION

Information Wanted

To The Editor,

Dear Sir,—

I am interested in obtaining information from any member who has had experience in sending invoices along with packaged goods. The information we particularly desire is the method employed in issuing invoices quickly enough to allow them to go with the goods and without delaying the shipment of these goods. Any information, either you or any member of the Society can give in this connection, will be gratefully received.

—COMPANY "A".

To The Editor,

Dear Sir,—

One of the biggest problems our company has to face is the matter of inventory valuation. We have a Standard Cost System, which, more or less, precludes the old idea of inventory valuation at cost or market, whichever is lower. Since our last inventory, quite a portion of our present inventory has been purchased at much increased cost, and standards have not been increased. The difference has been taken care of by charging the variance between standard and actual to a material variance account, but, what we particularly desire to know is, how should we value our inventory, taking into account the matter of income tax and, of course, profit on materials purchased since last inventory, on which the present market price is now much higher? If you can give us any data on this matter, we shall be very grateful.

—COMPANY "B".

The matter of inventory valuation is one which has occupied the thoughts of accountants and executives for some considerable time. Much has been heard lately concerning the normal stock method, so-called, and the last in, first out method designed to at least partially preclude inventory profits. Undoubtedly, the matter of correct inventory valuation is a serious business, but it does seem that, in your case, in pricing your inventory at present, or cost, price, the various charges to material variance account must be taken into consideration. This fact, to some extent, would preclude inventory profits. The N.A.C.A. Bulletin of October 1st, 1937, contains a most interesting article on this subject, and advances the theory of the use of Price Adjustment Accounts to segregate inventory losses and gains. Other valuable contributions on the subject of inventory valuation are: Current Practices in Inventory Valuation, N.A.C.A., March 1st, 1937; Problems of Present Day Inventory Valuation, N.A.C.A., March 1st, 1937, and Preparation and Taking of Inventories, Cost and Management, April, 1930. All these articles are available if desired, and, in addition, the N.A.C.A. 1936 year book contains a most valuable article on Present Day Problems of Inventory Valuation, by Maurice E. Peloubet. Members are asked to send in any contributions they may have on this subject.—Editor.

Reference Literature

RECEIVED IN SEPTEMBER

Magnetic Core Materials Practice.

This is a book prepared by the Research and Engineering staffs of the Allegheny Steel Company, Brackenridge, Pa., and contains a mine of useful information for the use of engineers and production men, as well as cost accountants in the electrical engineering field.

Figure Gauges in Department Stores.

The Chartered Accountant, in Australia.

The report of an address by Mr. A. H. Tolley, Dip. Comm., before the Chartered Accountants (Australia) Research Society of Victoria. This is an aspect of the situation from a management, rather than from an accounting point of view, and, as such, should prove interesting reading, especially for those engaged in department store work.

Aspects of Gross Profit.

The Accountants' Journal. August 20.

An article by Thomas D. Hadley, F.C.A.A., which gives some interesting sidelines on a topic on which there is a wide difference of opinions, and well worth reading.

Indices of Taxes—Visible and Invisible.

National Association of Cost Accountants. September 15.

An article by Paul E. Remington—a case study. Probably the subject of incidence of taxation—of determining the extent to which various taxes are passed on—belongs in the field of economics, rather than accounting. But who is better qualified than the cost accountant to calculate the effect on costs of increased taxes of various sorts? Who is better qualified to estimate to what extent it will be necessary and possible to pass on these increased costs to consumers?

Blocked Currencies and International Trade.

The Accountant. September 11.

A splendid article by H. R. S. Vaseau, which deals particularly with Germany's difficulties in financing her foreign trade. Of real value to all students of economics.

Presentation of Final Accounts.

The Accountant. September 18.

A discussion of a number of interesting points in connection with the form of accounts by W. Roger Carter, M.A., A.C.A. Among the many matters discussed by the author in this article are: Reserves for income tax, half yearly accounts, secret reserves, the grouping of items, and submission of accounts in statement form and holding companies' accounts.

Accountants and Depreciation.

The Accountant. September 18.

A short, leading article, well worth the trouble of reading by all accountants.

COST AND MANAGEMENT

RECEIVED IN OCTOBER

Principles of Public Utility Depreciation.

American Accounting Association.

A very complete monograph by Perry Mason, and issued by the American Accounting Association. This monograph is designed to clarify the underlying issues and to point the way to their sound solution, and it undoubtedly constitutes a significant contribution to the attainment of these ends. Professor Mason analyzes the general principles of depreciation, examines and appraises the concepts and methods pursued in this sphere by public utility enterprises and regulatory commissions, and traces the development of the attitudes of the courts toward the policies and practices involved. While there is no disposition to gloss over difficulties, avoid technical problems, or shrink from the formulation of definite conclusions, prime emphasis is placed upon the fundamental nature of depreciation, carefully probed from all significant angles, the practical circumstances which surround its determination, and the necessities of consistent and workable procedures. That, in part, is what I. L. Sharfman, Professor of Economics at the University of Michigan, has to say about this work, and in that we heartily concur. It has been a delight to review this monograph, and we recommend it to any one who has occasion to delve into the many perplexities surrounding the problem of depreciation.

Educating Our Students—What Is Our Responsibility?

The Canadian Chartered Accountant. October.

By an old friend, in the person of Kris A. Mapp, and being an address given before the Dominion Association of Chartered Accountants. Mr. Mapp deals with his subject in a most comprehensive and entrancing manner, and, while the subject may not have the appeal that cost or accounting subjects have for the average reader of such literature, it is one which should be read both by students and those responsible for their training and well being.

Inventory Valuation.

National Association of Cost Accountants. October 1.

By Clarence B. Nickerson, Assistant Professor of Accounting, Harvard University. An article of considerable value to those, and there are many, who are troubled in connection with inventory valuations. This article presents a new line of attack on a problem of considerable interest, and advocates the segregation of inventory gains and losses.

Comparative Evaluation of Occupations in Industry.

National Association of Cost Accountants. October 1.

Presents a plan for the comparative valuation of the various occupations in a particular company, or industry. The author outlines a suggested method to be followed in making such a comparative evaluation, and illustrates the practical application of the method described. Of real interest to cost accountants, production managers and those engaged in management generally.

Chapter Notes

Hamilton.

The opening meeting of the Hamilton Chapter was held at the Wentworth Arms Hotel, on October 6th, when a large gathering was on hand to hear the newly-appointed Secretary-Manager of the Society, Mr. R. Dawson, speak on "The Future Of Our Society." Mr. Dawson outlined the work of the Society to date, and, also, many plans for the future. He spoke in optimistic vein concerning the future and advocated standardization of programs, in order that members could receive the utmost benefit from the various Chapter meetings. He also urged the Chapter to take a real interest in the educational work of the Society, and considered that each Chapter should organize a student section. Five new members were introduced at this meeting, at which W. G. Smitton, Chairman of the Hamilton Chapter, presided. M. I. Long, C.A., introduced the speaker, and A. G. Howey moved a hearty vote of thanks at the close. The next meeting of the Chapter will be held in Kitchener, on October 27, at which meeting Mr. H. M. Hetherington, of Toronto, will speak on "Forecasting Costs." This meeting is being held in Kitchener in order to assist in the formation of a Kitchener Chapter of the Society, and it is hoped that a large number of the members, and their friends, will turn out for this meeting.

On September 23, the annual golf game was played, at the Burlington Golf and Country Club, and resulted in a good turnout of members, including several from the Toronto Chapter. Bill Smitton captured the low net prize, with Harold Wright, of Hamilton, and C. D. Landell, of Toronto, being tied for low gross. Bill Eplett and Jim Hammond captured hidden hole prizes. Following the game, a dinner was held in the club house, and Harold Wright, C. D. Landell and R. Dawson each gave short addresses.

As a direct result of this golf game, Harold Wright and Bill Smitton challenged Perce Roberts and George Abrams, of Toronto, to a later game. According to reports, this game was played, on the same course, on Sunday, October 3, and, although no details as to the score are available, the Hamilton boys claim that it was a "slaughter," in their favor.

Toronto.

The opening meeting of the Toronto Chapter was held on September 21, at the Royal York Hotel, and was a huge success. The attendance was good, in view of the fact that several members were away holidaying, and those who did attend were well rewarded for their trouble. The speaker was R. Dawson, Secretary-Manager of the Society, who spoke on "The Future Of Our Society," and he was warmly received by the audience. Mr. Dawson spoke of the work of the Society since incorporation, in 1920, down to the present, and outlined many plans for the future. He urged all members to take a keen interest in the work of their Chapter, and to use the literature at head office whenever possible. He also urged more consideration for student members, and advocated a student section in all Chapters. In optimistic vein, he told his hearers that the re-organization

COST AND MANAGEMENT

of the Central Ontario Chapter would soon be an accomplished fact, and had great hopes concerning a similar procedure in connection with the Vancouver and Winnipeg Chapters, as well as the formation of new Chapters in London and the Niagara Peninsula.

Community singing was indulged in during the dinner, which preceded the meeting, the latter being presided over by George Appleton, Chairman of the Chapter. One new member was introduced at this meeting. W. M. Lane, Vice-President of the Society, introduced the speaker.

Montreal.

The opening meeting of the Montreal Chapter was held at the Windsor Hotel on September 29th, and was an unqualified success; in fact this was just about the best meeting in the history of the Chapter, at least in recent years. The entire program was carried out according to schedule and with a large attendance and a splendid speaker, the Chapter certainly got away to a flying start. The speaker was Major-General McNaughton, President of the Research Council at Ottawa, and his talk was much enjoyed by the large crowd present. Owing to the fact that General McNaughton's address is produced elsewhere in this issue, little will be mentioned about it here, except to say that his talk was very much appreciated by those who were fortunate enough to hear it. As is well known, our Dominion President, George T. Bowden, a member of the Montreal Chapter, has been ill for some time at his home and naturally was unable to be present. However, through the medium of the air, greetings from the Chapter were broadcast to him over Station CFCF, and General McNaughton's address was also broadcast. Mr. Bowden listened in on the proceedings and, judging by a letter received from Mrs. Bowden by the Montreal Chapter, this kindly thought by the Chapter was something which our President will never forget. The Chapter program is also published elsewhere in this issue and in this connection it is interesting to note that on November 12th, in conjunction with Professor French's talk, our Dominion Secretary-Manager, Mr. R. Dawson, will speak on the subject of "The Future of Our Society." It is to be hoped that members will be on hand in large numbers to greet him and also to hear him, as well as Professor French. The outlook for the Montreal Chapter is very bright and much progress is anticipated during the course of the present season.

MEMBERS ARE REMINDED THAT THE ANNUAL FEES ARE NOW DUE AND THOSE MEMBERS WHO HAVE NOT YET PAID ARE ASKED TO REMIT TO THEIR CHAPTER SECRETARY AS SOON AS POSSIBLE IN ORDER THAT COMPARATIVE STATEMENTS AS TO THE INCREASE IN MEMBERSHIP MAY BE DETERMINED UP TO THE END OF SEPTEMBER.

New Members

Montreal Chapter.

- M. Shuter, W. C. Pitfield & Co., Montreal.
A. A. Badnag, Pesner Bros., Ltd., Montreal.
W. J. Robitaille, Shawinigan Engineering Co., Ltd., Montreal.
Robert Davis, c/o Wm. J. Hyde, C.A., Montreal.

Toronto Chapter.

- R. P. Fisher, W. D. Beath & Son, Ltd., Toronto.
E. Rounding, The Robert Simpson Co., Ltd., Toronto.
S. F. Saunders, C. A. Riddell, Stead, Hutchinson & Graham, Toronto.
C. S. Smith, Dominion Paper Box Co., Ltd., Toronto.
H. G. Smith, Consumers Gas Co., Ltd., Toronto.
(The above members take the place of others from the same firms.)
J. F. Roberts, J. P. Langley & Co., Toronto.
Fred C. Eckhart, General Steel Wares, Ltd., Toronto.
W. T. Ferguson, Canadian Kodak Co., Ltd., Mount Dennis.

Non-Resident.

- W. A. Shuker, C.A., M. S. Donovan & Co., Brandon, Man.

Student.

- A. G. Griffith, Pacific Mills, Ltd., Ocean Falls, B.C.

Hamilton Chapter.

- A. J. Kenrick, The Gilson Manufacturing Co., Ltd., Guelph, Ont.
W. I. Jardine, Clare Bros., Co., Ltd., Preston, Ont.
J. Couborough, Hamilton Hydro Electric System, Hamilton.
A. J. Ballentyne, Firestone Tire & Rubber Co., Ltd., Hamilton.
D. R. Caskie, Firestone Tire & Rubber Co., Ltd., Hamilton.

Business Trend

Official reports show an increase in power output of Canadian central stations in the month of August, representing a gain of 8.7% over August of last year. Likewise, payrolls in Canada climbed appreciably in August. The number of persons employed, reported by 10,336 employers, being 1,174,041 as of September 1, and representing a gain over the figures of August 1 of 30,581.

Dividend payments of Canadian companies in September were higher than the same month last year by \$4,164,429.

Latest trade figures for August give evidence of expansion in exports of iron and its products from Canada, the increase being 105% over the like month a year ago. Non-ferrous metals continued to lead all divisions in point of total value, being 40% higher at \$31,503,183. Animal and animal products gained sharply, as did wood, wood products and paper, at

COST AND MANAGEMENT

\$24,030,070. These gains more than offset the slump in exports of agricultural food products, which totalled about half those of a year ago.

Net earnings of Canadian railways showed mild declines in August. C.P.R. suffered a decrease in gross, while C.N.R. gross gained moderately. Two flour companies reporting for the past fiscal year showed gains in earnings, but the outlook for the new year is not so good, as high wheat prices here make competition abroad more difficult. Paper companies continue to report favorably on operations and earnings, output generally being at or close to capacity. Power companies in various parts of Canada report gains in output in August. September construction in Canada was 31% ahead of the like month a year ago, and contemplated work is now valued at \$329,147,100, or 56.3% above a year ago. Record output of oil for Alberta was reported for August. A score of Canadian companies of various descriptions report expansion in sales and earnings this year to date of important proportions.

Standardization

Much has been heard in recent months regarding the standardization of cost accounting methods in various industries and a recent investigation by the Federal Government has brought into the open the crying need of such standardization. By this is meant, not standardization of costs, but of the method of arriving at such costs, and much needs to be done along

Loose Leaf Forms, Binders,
Trays, and Visible Index Sys-
tems.

Lithographed Letterheads, In-
voices, Statements, Drafts,
Cheques, etc.

Continuous Typewriter Forms
in all styles with carbon inter-
leaved when desired, and vari-
ous devices for use with them.
Autographic Registers, desk or
portable types, with forms to
suit your requirements.

Shipping and Factory Tags.
Handisets for all purposes.

Business Systems Limited

Manufacturers of Business Forms in
sheets or webs for every purpose,
printed or lithographed.

52-56 Spadina Ave. — Toronto 2

COST CLERKS and COST ACCOUNTANTS

For more than thirty years
we have been training men
along Cost Accounting lines.
The large number of our
graduates who have risen to
high executive positions
prove the effectiveness of
our plan.

You may have a copy of our
catalogue by writing

W. G. CANNING
International Accountants
Society Inc.
805 Central Bldg.
Toronto, Ont.

STANDARDIZATION

these lines. Much can be done also if those engaged in various industries will sink their prejudices and co-operate in a real effort to accomplish a definite end. Government officials are loud in their condemnation of the multifarious methods adopted to arrive at a cost, and their investigations have often proved to be of little importance, if not absolutely futile, because of the many and varied methods adopted in similar industries. The matter of Sales Tax also could be simplified if standardization of methods were adopted. The textile industry is one which could undoubtedly stand such standardization and another is the printing industry. It is doubtful if any industry is in such a precarious state at this time as this latter industry, and if methods of cost finding in this industry were made standard, the industry would very soon be on a firmer foundation. As it is, quite a number of firms in this industry do not actually know what their costs are because of defective cost systems, and even in some cases of no system whatever. Reams could be written regarding the need for standardization of methods, and while we realize that we are perhaps treading on dangerous ground, we believe that something of this kind must be accomplished and before very long. The Federal Customs Board at Ottawa, we believe, would welcome a move of this kind, and who is in a better position to commence such a move than The Canadian Society of Cost Accountants and Industrial Engineers? Such a move would not mean the formation of Trade Associations with a view to price fixing, but it would mean that those engaged in any particular industry where such standardization of methods had been adopted would know that the cost they had arrived at would be a true cost. Price cutting would be lessened, profits instead of losses would result, cost saving methods would be adopted and the cost accountant would come into his own. Certainly it is a matter worth considerable thought and one which cost accountants generally would do well to study.

Our President

Members of The Canadian Society of Cost Accountants and Industrial Engineers will learn with extreme pleasure that the condition of our President, Mr. George T. Bowden, of Montreal, is showing steady, if slow improvement. Each Chapter, at its opening meeting, sent greetings to the President and, as is reported on another page, the Montreal Chapter broadcast these greetings as well as the talk by Major-General McNaughton. To say that Mr. and Mrs. Bowden are delighted by the receipt of these greetings and good wishes is putting it mildly and head office is in receipt of letters from Mrs. Bowden and also one from Mr. Bowden showing their sincere gratitude for such good wishes. Mr. Bowden has given much of his time and his undoubted ability to the work of this society. He has been a source of inspiration to many of the members and each member will voice a fervent hope that he will soon be among us once more. This society cannot spare, even for a short time, members of the stamp of our President.



Past President

Harold P. Wright, Immediate Past Dominion President, Canadian Society of Cost Accountants & Industrial Engineers. Mr. Wright was born in Derby, England, and received his education in that city. Came to this country in 1913, and was first employed by the now defunct Hamilton Stove & Heater Co., Ltd., in Hamilton, Ont. Later, he went to Almonte in a similar industry, but returned to Hamilton after about two years. Was with the W. E. Johnson Co., Chartered Accountants, for some time, becoming manager of their Hamilton Branch until the firm was taken over by Oscar Hudson & Co. Then formed his own company, of Wright, Pounder Co., of which he is head. Mr. Wright was Chairman of the Hamilton Chapter in 1933-34, and is at present a director of that Chapter, in the work of which he takes a keen interest. Was Dominion President in season 1936-37. Plays golf consistently, more or less, in the low eighties, and is an all 'round good fellow.

